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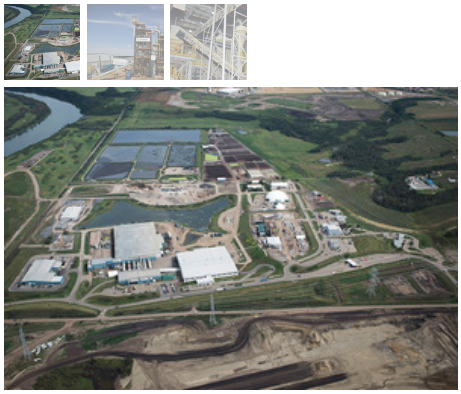
Pepped to Fuel Prep

Municipal solid waste that undergoes Enerkem's thermochemical gasification process at its Edmonton, Alberta, plant has made a long and complicated journey before it is converted into liquid fuel.

By Anna Simet | September 02, 2014



Anything from car batteries to tires to toys shows up in residential waste that arrives at the city of Edmonton's waste transfer station. The 25 full-time employees who work on site go to great lengths to make sure all compostable, recyclable and hazardous materials are removed from the waste stream before it reaches its final destination—Enerkem's cellulosic ethanol production facility, which is located right on site.

Not only must all nonsuitable materials be separated and repurposed, but fuel arriving via conveyor in Enerkem's 14,000-square-foot storage facility must be appropriately sized and dried, according to contract specifications. "When it arrives at our facility, it is already prepared and ready to use," explains Marie-Helene Labrie, senior vice president of government affairs and communications. "Under contract, they provide us with 100,000 dry tons per year of nonrecyclable and noncompostable fuel, and we'll convert that into 38 million liters of ethanol per year annually, though methanol is our first product."

From the storage facility, Enerkem's feeder system sends MSW into its gasifier, Labrie says. Seems simple enough, but the MSW has been rigorously combed through, separated, screened and shredded numerous times before it reaches that point.

It all starts with the collection trucks, according to Gordon Derick, general supervisor of engineering and technical services. "We have a recycle program for which we ask residents to put recyclables in a separate bag," he says. "That doesn't always happen, but we do have a sort room."

There, employees pull out any obvious recyclables or hazardous materials in the waste, such as dry acid batteries and oil filters. "They pull out anything that might cause a problem with the rest of the processing equipment—long, stringy items and bulky items like tires on rims and engine parts," Derick says.

Waste then continues onto two lines, which begin with 80-foot long, 12-foot diameter trommels, or rotating screens, which host spikes to slash open trash bags, as well as a series of different-sized holes to capture small organics. "The first half of the trommel has a set of 2-inch holes—most organics fall out there, and we do get some nonorganic small stuff. The back half of the trommel is a set of 9-inch holes. The 9-inch material then goes over a 5-inch screen, and the stuff that's smaller than 5 inches goes to the composter along with the 2-inch, and the bigger stuff coming out of the end of the trommel is feed for the RDF facility."

The material that arrives at the RDF site is mostly paper and plastics, though clothing and other composites that are a mixture of materials—running shoes and toys—occasionally makes its way in. First, it is sent past a large magnet equipped with a belt to pick up magnetic material and toss it out of the stream into a bin, to avoid any large pieces of metal going through the primary shredder, which serves two functions. "In some cases, not all the bags get opened and emptied when it goes through the trommels, so the primary shredder tears those bags up pretty good to make sure," Derick says. "The other purpose is to do a little more sizing, as the primary shredder is set at 6 inches."

After the primary shredder, material is sent past another type of magnet to get any last bit of metals out, and then split between two large waste screens. "One is set at about a 1-inch size—to get any remaining wet organics out," Derick says, reiterating that Enerkem's fuel specs are between 15 and 20 percent moisture. "That's an issue for us," he admits. "We are looking into drying options."

Following the waste screens, the oversized material is sent to landfill and undersized materials to the composter. What remains in the stream is close to making its final journey to Enerkem's storage unit, but not before it enters a wind sifter. "Basically, it's a density separation using air," Derick explains."The air is blown through what's called an air knife, a slit the width of the conveyor that uses air pressure to force the lighter materials up. They move to another conveyor, and heavier materials drop out and are routed to a bin where we can send those to landfill as well. That's to ensure things like glass, bricks and any other missed metals can be separated out. We don't want those going to Enerkem."

Lighter material moves through an additional wind sifter and two Eddy current machines, which use polarity to remove aluminums and lighter metals that get through the density separation. “It knocks those materials off the belt,” Derick says. Finally, waste goes through two reshredders set at a 2-inch size, once again to meet Enerkem’s fuel specs. Once it crosses weigh scales, the material is on its way to Enerkem’s storage facility, via a Vecoplan-supplied Vecobelt, an 18-inch diameter, tubular conveyor that uses air to move product. “A fan supplies air under the belt,” Derick explains. “Because it is running on air, there is a lot less wear and tear, and it can run a lot faster than a typical conveyor.”

The fuel arrives at the bunker system, which is comprised of seven different storage compartments to allow Enerkem to mix and match feedstock based on energy content or dryness.

On challenges in properly prepping feedstock according to contract, Derick says deciding on the right shredding system proved to be difficult. “We went through a few different iterations of design— we originally looked at high-speed shredders, but there are a number of challenges with those in terms of shredding potential explosive materials. There’s dust in the waste, because it’s got wood and paper, and with a high-speed shredder there is more of a chance, if a piece of metal goes through and you get a spark, of an explosion. We went with low-speed shredders to design for a nonhazardous facility. That saved us some money, otherwise we would have had to have the final shredders in a separate building.”

Overall, Derick says the project, which will divert 90 percent of Edmonton’s waste from the landfill, has been very good. “Vecoplan was great to work with, and we were able to get project done in specified timeline,” he added. “It all went well, we were on budget, and it was a good experience.”

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